

WHAT IS CLAIMED IS:

1. A series regulator comprising:

a power transistor connected in series between an input
terminal to which a non-stabilized voltage is applied and
5 an output terminal;

an amplifier for changing an internal resistance of
the power transistor based on a result of a comparison between
an output voltage of the power transistor and a reference
voltage, and outputting a stabilized constant voltage to
10 the output terminal;

a first bias current circuit for generating a bias
current to be supplied to a reference voltage circuit that
generates the reference voltage, based on a non-stabilized
voltage applied to the input terminal;

15 a resistance voltage dividing circuit for generating
a divided voltage of a predetermined value from an output
voltage of the power transistor;

an output voltage detecting circuit including

a first transistor to a control end of which
20 there is applied a conversion voltage of a bias current that
the first bias current circuit supplies to the reference
voltage circuit; and

a second transistor to a control end of which
there is applied the divided voltage,

25 wherein the output voltage detecting circuit

having a differential structure such that the second transistor is turned on and the first transistor is turned off when the divided voltage has reached a value of the conversion voltage;

5 a second bias current circuit for generating a bias current to be supplied to the reference voltage circuit in response to the on-operation of the second transistor, based on an output voltage of the power transistor; and

10 a bias switching circuit for stopping a bias-current supply operation of the first bias current circuit in response to a starting of the operation of the second bias current circuit.

2. The series regulator according to claim 1, wherein
15 the first bias current circuit and the second bias current circuit are structured to supply a bias current to the amplifier, and a switching of a bias-current supply to the amplifier is executed linked with a switching of a bias-current supply to the reference voltage circuit.

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3. A series regulator comprising:

 a power transistor connected in series between an input terminal to which a non-stabilized voltage is applied and an output terminal;

25 an amplifier for changing an internal resistance of

the power transistor based on a result of a comparison between an output voltage of the power transistor and a reference voltage, and outputting a stabilized constant voltage to the output terminal;

- 5 a resistance voltage dividing circuit for generating a divided voltage of a predetermined value from an output voltage of the power transistor;

- 10 a first bias current circuit for generating a bias current to be supplied to a reference voltage circuit that generates the reference voltage, based on a non-stabilized voltage applied to the input terminal, the first bias current circuit for supplying a bias current to the reference voltage circuit during a period while a first transistor to a control end of which a conversion voltage of the bias current is applied is in on-operation;
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- a second bias current circuit for generating a bias current to be supplied to the reference voltage circuit, based on an output voltage of the power transistor, the second bias current circuit for supplying a bias current to the reference voltage circuit during a period while a second transistor to a control end of which the divided voltage is applied is in on-operation,
- 20

- wherein the first bias current circuit and the second bias current circuit are differentially structured such that the second transistor is turned on when the divided voltage
- 25

has reached a value of the conversion voltage, and the first transistor is turned off following this.

4. The series regulator according to claim 3, wherein
5 the first bias current circuit and the second bias current circuit are structured to supply a bias current to the amplifier, and a switching of a bias-current supply to the amplifier is executed linked with a switching of a bias-current supply to the reference voltage circuit.

10 5. A series regulator comprising:

a first power transistor connected in series between
an input terminal to which a non-stabilized voltage is
applied and a first output terminal;

15 a first amplifier for changing an internal resistance of the first power transistor based on a result of a comparison between an output voltage of the first power transistor and a reference voltage, and outputting a stabilized constant voltage to the first output terminal;

20 a second power transistor connected in series between the input terminal and a second output terminal;

a second amplifier for changing an internal resistance of the second power transistor based on a result of a comparison between an output voltage of the second power
25 transistor and the reference voltage, and outputting a

stabilized constant voltage to the second output terminal;

a first resistance voltage dividing circuit for generating a first divided voltage of a predetermined value from an output voltage of the first power transistor, and
5 a second resistance voltage dividing circuit for generating a second divided voltage of a predetermined value different from the first divided voltage, from an output voltage of the second power transistor;

a first bias current circuit for generating a bias
10 current to be supplied to a reference voltage circuit that generates the reference voltage, based on a non-stabilized voltage applied to the input terminal, the first bias current circuit for supplying a bias current to the reference voltage circuit during a period while a first transistor to a control
15 end of which a conversion voltage of the bias current is applied is in on-operation;

a second bias current circuit for generating a bias current to be supplied to the reference voltage circuit, based on an output voltage of the first power transistor,
20 the second bias current circuit for supplying a bias current to the reference voltage circuit during a period while a second transistor to a control end of which the first divided voltage is applied is in on-operation; and

a third bias current circuit for generating a bias
25 current to be supplied to the reference voltage circuit,

based on an output voltage of the second power transistor,
the third bias current circuit for supplying a bias current
to the reference voltage circuit during a period while a
third transistor to a control end of which the second divided
5 voltage is applied is in on-operation,

wherein the first bias current circuit, the second
bias current circuit, and the third bias current circuit
are differentially structured such that only a corresponding
one of the second transistor and the third transistor is
10 turned on when either the first divided voltage or the second
divided voltage having a higher value has first reached a
value of the conversion voltage, and the first transistor
is turned off following this.

15 6. The series regulator according to claim 5, further
comprising a circuit for switching the on/off operations
between the second transistor and the third transistor to
stop the operation of the first power transistor or the second
power transistor that is generating an output voltage on
20 which basis a bias current is being supplied.

7. The series regulator according to claim 5, wherein
the first bias current circuit, the second bias current
circuit, and the third bias current circuit are structured
25 to supply a bias current to the amplifiers, and a switching

of a bias-current supply to the amplifier is executed linked with a switching of a bias-current supply to the reference voltage circuit.